



Search Report

EIC 1700

STIC Database Tracking Number 231637

To: WAYNE LANGEL
Location: REM-9A29
Art Unit: 1754
Wednesday, July 25, 2007
Phone: (571) 272-1353
Case Serial Number: 10 / 518644

From: JAN DELAVAL
Location: EIC1700
REM-4B28 / REM-4A30
Phone: (571) 272-2504

jan.delaval@uspto.gov

Search Notes

JUL 20 2007

SEARCH REQUEST FORM

Scientific and Technical Information Center

Pat. & T.M. Office

Requester's Full Name: Wayne Lange Examiner #: 60603 Date: 7-20-07
Art Unit: 1754 Phone Number: 202-1353 Serial Number: 10/518644
Mail Box and Bldg/Room Location: E09A29 Results Format Preferred (circle) PAPER DISK E-MAIL
(Kensner)

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Sp³ bond boron nitride emitting light in ultraviolet region, its producing method, and functional material using same

Inventors (please provide full names): Shojiro Kamatsu,
Katsuyuki Okada, Yusuke Moriyoshi

Earliest Priority Filing Date: 7-2-02

For Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

Please search claims 1-12, as attached hereto.

STAFF USE ONLY

Searcher: Don

Searcher Phone #: _____

Searcher Location: _____

Date Searcher Picked Up: 7/25/07

Date Completed: 7/25/07

Type of Search

NA Sequence (#) _____

AA Sequence (#) _____

Structure (#) _____

Bibliographic ☒

Litigation _____

Vendors and cost where applicable

STN ☒

Dialog _____

Questel/Orbit _____

Dr.Link _____

Lexis/Nexis _____

=> fil hcaplus

FILE 'HCAPLUS' ENTERED AT 16:28:19 ON 25 JUL 2007

USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.

PLEASE SEE "HELP USAGETERMS" FOR DETAILS.

COPYRIGHT (C) 2007 AMERICAN CHEMICAL SOCIETY (ACS)

Copyright of the articles to which records in this database refer is held by the publishers listed in the PUBLISHER (PB) field (available for records published or updated in Chemical Abstracts after December 26, 1996), unless otherwise indicated in the original publications. The CA Lexicon is the copyrighted intellectual property of the the American Chemical Society and is provided to assist you in searching databases on STN. Any dissemination, distribution, copying, or storing of this information, without the prior written consent of CAS, is strictly prohibited.

FILE COVERS 1907 - 25 Jul 2007 VOL 147 ISS 5

FILE LAST UPDATED: 24 Jul 2007 (20070724/ED)

New CAS Information Use Policies, enter HELP USAGETERMS for details.

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d l109 bib ab hitind hitstr retable tot

L109 ANSWER 1 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2004:41398 HCAPLUS

DN 140:101789

TI **Sp3 bonded boron nitride emitting**

UV light, its production method, and functional material

IN **Komatsu, Shojiro; Okada, Katsuyuki; Moriyoshi, Yusuke**

PA **National Institute for Materials Science, Japan**

SO PCT Int. Appl., 30 pp.

CODEN: PIXXD2

DT **Patent**

LA Japanese

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2004005186	A1	20040115	WO 2003-JP8370	20030701 <--
	W: US				
	RW: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR				
	JP 2004035301	A	20040205	JP 2002-192863	20020702 <--
	JP 3598381	B2	20041208		
	EP 1518824	A1	20050330	EP 2003-738617	20030701 <--
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI, RO, CY, TR, BG, CZ, EE, HU, SK				
	US 2006163527	A1	20060727	US 2004-518644	20041220 <--
PRAI	JP 2002-192863	A	20020702	<--	
	WO 2003-JP8370	W	20030701	<--	

AB The invention refers to a **B nitride** suitable for use as an electronic material for electroluminescent devices, **UV** solid state lasers, and coating material, having **hexagonal 5H or 6H** polygonal structure which **emits UV light**, produced by mixing B-containing and N-containing **gases** and a diluent **gas** in a reactor,

irradiating a substrate inside the reactor with UV light to deposit the B nitride on the substrate.

IC ICM C01B0021-064
ICS C23C0014-06; C23C0016-38

CC 73-11 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 49

ST boron nitride UV radiation laser
electroluminescent device

IT Electroluminescent devices
Solid state lasers
UV lasers
(Sp3 bonded boron nitride emitting UV light, its production method, and functional material)

IT 10043-11-5P, Boron nitride, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(Sp3 bonded boron nitride emitting UV light, its production method, and functional material)

IT 7664-41-7, Ammonia, reactions 19287-45-7, Diborane
RL: RCT (Reactant); RACT (Reactant or reagent)
(Sp3 bonded boron nitride emitting UV light, its production method, and functional material)

IT 10043-11-5P, Boron nitride, uses
RL: DEV (Device component use); SPN (Synthetic preparation); PREP (Preparation); USES (Uses)
(Sp3 bonded boron nitride emitting UV light, its production method, and functional material)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Director General Of Nat	1998			JP 10-7409 A	HCAPLUS
National Institute For	1994			JP 06-316402 A	HCAPLUS
National Institute For	1994			US 5286533 A	HCAPLUS
Semiconductor Energy La	1991			JP 03-79770 A	HCAPLUS
Sumitomo Electric Indus	1993			JP 05-4808 A	HCAPLUS

L109 ANSWER 2 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2002:933559 HCAPLUS

DN 138:212175

TI Highly crystalline 5H-polytype of sp3-bonded boron nitride prepared by plasma -packets-assisted pulsed-laser deposition: An ultraviolet light emitter at 225 nm

AU Komatsu, Shojiro; Kurashima, Keiji; Kanda, Hisao; Okada, Katsuyuki; Mitomo, Mamoru; Moriyoshi, Yusuke; Shimizu, Yoshiaki; Shiratani, Masaharu; Nakano, Toshiki; Samukawa, Seiji

- CS National Institute for Materials Science, 1-1 Namiki, ukuba, Ibaraki, 305-0044, Japan
- SO Applied Physics Letters (2002), 81(24), 4547-4549
CODEN: APPLAB; ISSN: 0003-6951
- PB American Institute of Physics
- DT Journal
- LA English
- AB Highly crystalline **5H-polytypic** form of **sp3**-bonded **boron nitride** (BN) was grown by pulsed-laser-vaporization of BN, where synchronous reactive-plasma packets assisted the crystal growth in the vapor phase. The structure of the product crystallites (.apprx.5 μ m) was confirmed by using transmission electron diffraction and electron energy loss spectroscopy. This material proved to have a sharp and dominant band at 225 nm by cathodoluminescence at room temps. and corresponding monochromatic images revealed that they uniformly emitted the UV light. Considering that **cubic BN** has already been doped as p- and n-type semiconductors, this material may be applied to the **light-emitting** devices working at almost the deepest limit of the UV region that is functional without vacuum.
- CC 73-5 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 75, 76
- ST cryst **boron nitride plasma** packet laser
deposition UV cathodoluminescence
- IT Crystallites
(UV cathodoluminescence of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT Cathodoluminescence
(UV; of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT Electron beams
(electron energy loss spectra; of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT Vapor deposition process
(laser ablation; UV cathodoluminescence of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT Crystallinity
Electron diffraction
Surface structure
(of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT Plasma
(reactive, packets; UV cathodoluminescence of highly crystalline **5H-polytype** of **sp3**-bonded **boron nitride** prepared by **plasma**-packets-assisted pulsed-laser deposition)
- IT 10043-11-5P, **Boron nitride** (BN), properties
RL: PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PRP (Properties); PYP (Physical process); PREP (Preparation); PROC (Process)

(UV cathodoluminescence of highly crystalline 5H-polytype of sp³-bonded boron nitride prepared by plasma-packets-assisted pulsed-laser deposition)

IT 7440-37-1, **Argon**, uses
 RL: NUU (Other use, unclassified); USES (Uses)
 (argon-ammonia reactive plasma gas; UV cathodoluminescence of highly crystalline 5H-polytype of sp³-bonded boron nitride prepared by plasma-packets-assisted pulsed-laser deposition)

IT 7664-41-7, **Ammonia**, uses
 RL: NUU (Other use, unclassified); RCT (Reactant); RACT (Reactant or reagent); USES (Uses)
 (argon-ammonia reactive plasma gas; UV cathodoluminescence of highly crystalline 5H-polytype of sp³-bonded boron nitride prepared by plasma-packets-assisted pulsed-laser deposition)

IT 10043-11-5P, **Boron nitride (BN)**, properties
 RL: PEP (Physical, engineering or chemical process); PNU (Preparation, unclassified); PRP (Properties); PYP (Physical process); PREP (Preparation); PROC (Process)
 (UV cathodoluminescence of highly crystalline 5H-polytype of sp³-bonded boron nitride prepared by plasma-packets-assisted pulsed-laser deposition)

RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon				JCPDS-ICDD No 42-136	
Bundy, F	1955	176	51	Nature (London)	HCAPLUS
Komatsu, S	2001	79	188	Appl Phys Lett	HCAPLUS
Komatsu, S	1999	103	3289	J Phys Chem B	HCAPLUS
Komatsu, S				Unpublished	
Mirkarimi, P	1997	21	47	Mater Sci Eng, R	
Mishima, O	1988	53	962	Appl Phys Lett	HCAPLUS
Mishima, O	1987	238	181	Science	HCAPLUS
Mishima, O	2000		495	Science and Technolo	
Pankove, J	1971			Optical Processes in	
Sokolowski, M	1979	46	136	J Cryst Growth	HCAPLUS
Spitzin, B	1981	52	219	J Cryst Growth	
Taniguchi, T	2002	41	L109	Jpn J Appl Phys, Par	HCAPLUS
Taylor, C	1994	65	1251	Appl Phys Lett	HCAPLUS
Ummels, R	1998	58	6795	Phys Rev B	HCAPLUS
Weissmantel, C	1980	72	19	Thin Solid Films	HCAPLUS
Wentorf, R	1957	26	956	J Chem Phys	HCAPLUS
Xu, Y	1991	44	7787	Phys Rev B	HCAPLUS
Yoshida, T	1996	5	501	Diamond Relat Mater	HCAPLUS

L109 ANSWER 3 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2000:856946 HCAPLUS

DN 134:104416
 TI Advances in the synthesis and characterization of **boron nitride**
 AU Huang, Jianyu; Zhu, Yuntian T.
 CS Division of Materials Science and Technology, Los Alamos National Laboratory, Los Alamos, NM, 87545, USA
 SO Diffusion and Defect Data--Solid State Data, Pt. A: Defect and Diffusion Forum (2000), 186-187(Defects and Diffusion in Ceramics III), 1-32
 CODEN: DDAFE7; ISSN: 1012-0386
 PB Scitech Publications
 DT Journal; General Review
 LA English
 AB A review, with 60 refs., of the progress in the expts. and understanding of high pressure and high temperature (HPHT) induced phase transformation in **boron nitride**. The HPHT induced phase transformation is significantly enhanced by refining the microstructure of the starting material, e.g., by ball-milling **hexagonal boron nitride (h-BN)** to a defective, nanocryst. or even amorphous state. For example, **cubic boron nitride (c-BN)** forms from nanocryst. or amorphous **BN (a-BN)** matrix at 900.degree.C and complete a-BN to c-BN phase transformation occurs at 1350.degree.C under 7.7 GPa. These temps. and pressures are significantly lower than required to transform coarse-grained crystalline **h-BN** to **c-BN**. High resolution TEM and EELS revealed that the **c-BN** phase nucleates directly from the **sp3** hybridized amorphous matrix, which is originally induced by ball milling and is therefore responsible for the lower HPHT requirements. This **c-BN** nucleation mechanism is completely different from the so-called diffusionless "puckering" mechanism that operates in the nucleation of **c-BN** from coarse-grained **h-BN** in HPHT expts., but very similar to one of the proposed mechanisms involved in the CVD of diamond and **c-BN**. HRTEM also shed new light on the phase transformation of slightly deformed coarse-grained **h-BN** under HPHT conditions. The interface structures among **h-**, **w-** and **c-BN** reveal that the phase transformation can proceed by different routes including $h \rightarrow w$, $h \rightarrow g$, $h \rightarrow w$, $h \rightarrow 6H'$, $h \rightarrow 2H'$, $h \rightarrow am$, where **h**, **w**, **c**, **g**, **6H'**, **2H'** and **am** represent **h-BN**, **w-BN**, **c-BN**, **g-BN**, **6H'-BN**, **2H'-BN** and **a-BN**, resp. Irresp. of these different transformation routes, all the phase transformations follow the same orientation relationships, i.e. $[1120]h//[1120]w//[110]c$ and $(1100)h//(1100)w//(111)c$. The phase transformations also follow a general rule: at low temps., the formation of **c-BN** is always preceded by the formation of intermediate phases such as **w-BN**, **2H'** and **6H'**, and the transformation is martensitic in nature; at higher temps., there is a direct **h-BN** to **c-BN** transformation, and the transformation is diffusional dominated. The transformation from **w-BN** to **c-BN** is achieved by introducing periodic stacking-faults (SFs) in **w-BN**. Based on the HRTEM images, three new BN **polytype** phases i.e., **g-BN**, **2H'-BN** and **6H'-BN**, were proposed for the first time. HRTEM also revealed that ball-milling introduces significant defects such as SFs,

twins, Frank dislocations, delamination, rotating and shearing of the sp² layers, and disordering in the h-BN lattice. These defects are found to promote the subsequent **hexagonal** to **cubic** transformation.

CC 57-0 (Ceramics)
 ST **boron nitride** phase transformation mechanism temp
 pressure review
 IT Structural phase transition
 (pressure- and temperature-induced; high-pressure and high-temperature
 induced
 phase transformation in **boron nitride**)
 IT 10043-11-5, **Boron nitride** (BN), processes
 RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
 (Technical or engineered material use); PROC (Process); USES (Uses)
 (high-pressure and high-temperature induced phase transformation in
boron nitride)
 IT 10043-11-5, **Boron nitride** (BN), processes
 RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM
 (Technical or engineered material use); PROC (Process); USES (Uses)
 (high-pressure and high-temperature induced phase transformation in
boron nitride)
 RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Amelinckx, S	1960	5	50	Phys Rev Lett	
Amelinckx, S	1966			Solid State Physics	
Berger, S	1988	57	285	Philo Mag Lett	HCAPLUS
Bohr, S	1995	4	714	Diamond Relat Mater	HCAPLUS
Bourgeois, L	1997	76	753	Philo Mag A	HCAPLUS
Bruley, J	1995	180	22	J Micros	HCAPLUS
Bundy, F	1963	38	1144	J Chem Phys	HCAPLUS
Choi, J	1993	76	2525	J Am Ceram Soc	HCAPLUS
Corrigan, F	1975	63	3812	J Chem Phys	HCAPLUS
Cottrell, A	1972		162	Dislocations and pla	
Cuomo, J	1991	58	466	Appl Phys Lett	HCAPLUS
De Vries, R	1972	13/14	88	J Cryst Growth	
Demazeau, G	1995	4	284	Diamond Relat Mater	HCAPLUS
Endo, T	1981	16	2227	J Mater Sci	HCAPLUS
Gladkaya, I	1986	117	241	J Less-Common Metals	HCAPLUS
Glaisher, R	1989	27	117	Ultramicroscopy	HCAPLUS
Green, J	1976	64	656	J Chem Phys	HCAPLUS
Heslop, R	1967			Inorganic Chemistry,	
Hess, J	1949	185	599	Trans AIME	
Hirano, S	1989	72	66	J Am Ceram Soc	HCAPLUS
Horiuchi, S	1998	78	1065	Phil Mag A	HCAPLUS
Huang, J	1996	44	1211	Acta Mater	HCAPLUS
Huang, J	1999	47	1801	Acta Mater	HCAPLUS
Huang, J	1999	303	130	Chem Phys Lett	HCAPLUS
Huang, J	2000	83	403	J Am Ceram Soc	HCAPLUS
Huang, J	1997		587	MRS Fall Meeting	
Huang, J	1999	79	217	Phil Mag Lett	HCAPLUS
Huang, J	1997			Unpublished result	

Huang, J	1998		327	the 5th NIRIM In	
Huang, J	1997			unpublished result	
Kelly, A	1970			Crystallography and	
Kelly, B	1981			Physics of Graphite	
Kester, D	1994	12	3074	J Vac Sci Technol A	HCAPLUS
Kobayashi, T	1979	70	5898	J Chem Phys	HCAPLUS
Kobayashi, T	1979	70	5898	J Chem Phys	HCAPLUS
Kurdyumov, A	1996	5	1225	Diamond Related Mater	
Lambrecht, W	1993	364	607	Nature (London)	HCAPLUS
Li, Z	1993	73	711	J Appl Phys	HCAPLUS
Luyten, W	1992	66	899	Philo Mag A	HCAPLUS
Mckenzie, D	1993	2	970	Diamond Relat Mater	HCAPLUS
Medlin, D	1994	50	7884	Phys Rev B	HCAPLUS
Mirkarimi, P	1997	R21	47	Mater Sci Eng	HCAPLUS
Mishima, O	1985	314	76	Nature	HCAPLUS
Muramatsu, W	1996	76	3846	Phys Rev Lett	
Orowan, E	1942	149	643	Nature (London)	
Pirouz, P	1993	51	189	Ultramicroscopy	HCAPLUS
Ramsdell, L	1947	32	64	Am Mineral	HCAPLUS
Singh, B	1995	152	143	J Cryst Growth	HCAPLUS
Solozhenko, V	1995	96	1	Solid State Comm	HCAPLUS
Solozhenko, V	1993	218	395	Thermochimica Acta	HCAPLUS
Sumiya, H	1983	18	1203	Mater Res Bull	HCAPLUS
Thomas, J	1963	84	4619	J Amer Chem Soc	
Turan, S	1995	150	227	Phys Stat Sol A	HCAPLUS
Verma, A	1966			Polymorphism and Pol	
Wakatsuki, M	1972	7	999	Mater Res Bull	HCAPLUS
Wentorf, R	1957	26	956	J Chem Phys	HCAPLUS
Wibbelt, M	1999	59	11739	Phys Rev B	HCAPLUS
Yamada-Takamura, Y	1999	59	10351	Phys Rev B	HCAPLUS
Yugo, S	1995	4	903	Diamond Relat Mater	HCAPLUS
Zhou, D	1995	72	163	Phil Mag Lett	HCAPLUS

L109 ANSWER 4 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2000:221836 HCAPLUS

DN 132:301861

TI Surface modification of boron nitride in
hydrogen plasma

AU Khvostov, V. V.; Konyashin, I. Y.; Shouleshev, E. N.; Babaev, V. G.;
Guseva, M. B.

CS Department of Physics, Moscow State University, Moscow, Russia

SO Applied Surface Science (2000), 157(3), 178-184

CODEN: ASUSEE; ISSN: 0169-4332

PB Elsevier Science B.V.

DT Journal

LA English

AB The state of the surface of poorly crystallized or amorphous (a-BN)
and highly oriented hexagonal (h-BN)

B nitride before and after treatment in a H

plasma was studied by high-resolution Auger electron spectroscopy.

Treatment of both modifications of BN in H

plasma is found to lead to a partial transformation of sp² bonds

into sp³ bonds on the surface. This probably is a result of

terminating dangling bonds of sp²-hybridized BN by H

atoms. The formation of chemical N-H bonds after treatment of

BN in H plasma is found on the surface of both

a-BN and h-BN, whereas in practice, B-

H bonds appear to form only on the treated surface of h-

BN.

CC 76-11 (Electric Phenomena)

Section cross-reference(s): 66

ST **hydrogen plasma** surface modification **boron nitride**

IT Bond
(**boron-hydrogen**; surface modification of **boron nitride** in **hydrogen plasma**)

IT Bond
(dangling; in surface modification of **boron nitride** in **hydrogen plasma**)

IT Bond
(**hydrogen-nitrogen**; surface modification of **boron nitride** in **hydrogen plasma**)

IT Bond
Density of surface states
Surface structure
(surface modification of **boron nitride** in **hydrogen plasma**)

IT 10043-11-5, **Boron nitride**, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(surface modification of **boron nitride** in **hydrogen plasma**)

IT 1333-74-0, **Hydrogen**, processes
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(surface modification of **boron nitride** in **hydrogen plasma**)

IT 10043-11-5, **Boron nitride**, properties
RL: PEP (Physical, engineering or chemical process); PRP (Properties); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(surface modification of **boron nitride** in **hydrogen plasma**)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Badzian, A	1988	23	385	Mater Res Bull	HCAPLUS
Ching, Y	1991	44	7787	Phys Rev B	
Dementjev, A	1997	6	486	Diamond Relat Mater	HCAPLUS
Fomichev, V	1968	29	1015	J Phys Chem Solids	HCAPLUS
Guseva, M	1987	11		Surface investigatio	
Harrison, W	1980			Electronic Structure	
Hofsass, H	1998	66	153	Appl Phys A	
Kejun, L	1995	24	341	J Synth Cryst	
Loeffler, J	1997	6	608	Diamond Relat Mater	HCAPLUS
Loeffler, J	1996	87	170	Z Metallkd	HCAPLUS
McKenzie, M	1993	2	970	Diamond Relat Mater	
Robertson, J	1996	5	519	Diamond Relat Mater	HCAPLUS
Saitoh, H	1992	1	137	Diamond Relat Mater	HCAPLUS
Spear, K	1989	72	171	J Am Ceram Soc	HCAPLUS
Trehan, R	1990	18	4026	J Vac Sci Technol A	HCAPLUS
Zunger, A	1974	7	176	J Physi C	HCAPLUS

L109 ANSWER 5 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 2000:130840 HCAPLUS
 DN 132:268664
 TI In situ ellipsometry growth characterization of dual ion beam deposited **boron nitride** thin films
 AU Franke, E.; Schubert, M.; Woollam, J. A.; Hecht, J.-D.; Wagner, G.; Neumann, H.; Bigl, F.
 CS Department of Electrical Engineering, Center for Microelectronic and Optical Materials Research, University of Nebraska, Lincoln, NE, 68588-051, USA
 SO Journal of Applied Physics (2000), 87(5), 2593-2599
 CODEN: JAPIAU; ISSN: 0021-8979
 PB American Institute of Physics
 DT Journal
 LA English
 AB Pure **hexagonal, h**, as well as mixed-phase **cubic/hexagonal, c/h, boron nitride** thin films were deposited onto [001] silicon substrates using the dual ion beam deposition technique. The BN thin films were grown under UHV conditions at different substrate temps. and ion beam bombarding parameters. Thin-film growth was monitored using in situ spectroscopic ellipsometry at 44 wavelengths between 420 and 761 nm. The in-situ ellipsometric data were compared with two-layer growth model calcns. for the mixed-phase **c/h BN**, and with one-layer growth model calcns. for pure **h-BN** growth. In-situ data provide information on the optical properties of deposited **h-BN** and **c/h-BN** material, film thickness, and **BN** growth rates. A virtual interface approach is employed for the optical properties of the silicon substrate. The growth and nucleation of **c-BN** observed here confirms the cylindrical thermal spike model. The results for composition and thickness of the BN films were compared to those obtained from ex-situ IR transmission measurements and high-resolution transmission electron microscopy investigations.

CC 57-2 (Ceramics)
 Section cross-reference(s): 73

ST dual ion beam deposited **boron nitride** film growth;
boron nitride layered film growth ellipsometry optical property

IT Films
 Films
 (ceramic, **boron nitride**; growth and properties of dual ion beam-deposited **boron nitride** films)

IT Phase composition
 (**cubic-hexagonal**; growth and properties of dual ion beam-deposited **boron nitride** films)

IT Ceramics
 Ceramics
 (films, **boron nitride**; growth and properties of dual ion beam-deposited **boron nitride** films)

IT Birefringence
 Crystal growth kinetics
 Interfacial structure
 Optical absorption
 Refractive index
 (growth and properties of dual ion beam-deposited **boron nitride** films)

IT Vapor deposition process
 (phys., dual-ion-beam; growth and properties of dual ion beam-deposited **boron nitride** films)

IT 10043-11-5, **Boron nitride**, properties
 RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (films; growth and properties of dual ion beam-deposited **boron nitride** films)

IT 7440-21-3, Silicon, processes
 RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
 (substrate; growth and properties of dual ion beam-deposited **boron nitride** films)

IT 10043-11-5, **Boron nitride**, properties
 RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
 (films; growth and properties of dual ion beam-deposited **boron nitride** films)

RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Aspnes, D	1996	14	1960	J Vac Sci Technol A	HCAPLUS
Aspnes, D	1983	27	1985	Phys Rev B	HCAPLUS
Azzam, R	1984			Ellipsometry and Pol	
Barth, K	1997	92	196	Surf Coat Technol	HCAPLUS
Collins, R	1994	233	244	Thin Solid Films	
Davis, C	1992	226	130	Thin Solid Films	
Feldermann, H	1999	74	1552	Appl Phys Lett	HCAPLUS
Franke, E	1997	82	2906	J Appl Phys	HCAPLUS
Franke, E	1998	84	526	J Appl Phys	HCAPLUS
Franke, E	1998			PhD thesis, Universi	
Franke, E	1997	97	190	Surf Coat Technol	HCAPLUS
Friedmann, T	1994	76	3088	J Appl Phys	HCAPLUS
Geick, R	1966	146	543	Phys Rev	HCAPLUS
Gielisse, P	1967	155	1039	Phys Rev	HCAPLUS
Hahn, J	1996	5	1103	Diamond Relat Mater	HCAPLUS
Hofsass, H	1998	66	153	Appl Phys A: Solids	
Hofsass, H	1995	67	146	Appl Phys Lett	HCAPLUS
Hofsass, H	1997	55	13230	Phys Rev B	HCAPLUS
Ichiki, T	1994	75	1330	J Appl Phys	HCAPLUS
Jellison, G	1998	313-3	33	Thin Solid Films	
Kester, D	1994	12	3074	J Vac Sci Technol A	HCAPLUS
Kuhr, M	1995	74-75	806	Surf Coat Technol	HCAPLUS
McKenzie, D	1991	70	3007	J Appl Phys	HCAPLUS
Mirkarimi, P	1994	9	2925	J Mater Res	HCAPLUS
Mirkarimi, P	1997	R21	147	Mater Sci Eng, R	HCAPLUS
Palik, E	1998			Handbook of Optical	
Park, K	1997	70	315	Appl Phys Lett	HCAPLUS
Poerschke, R	1991			Semiconductor Group	
Reinke, S	1994	4	272	Diamond Relat Mater	
Robertson, J	1996	5	519	Diamond Relat Mater	HCAPLUS
Schubert, M	1997	70	1819	Appl Phys Lett	HCAPLUS
Sene, G	1996	5	530	Diamond Relat Mater	HCAPLUS
Stenzel, O	1996	158	281	Phys Status Solidi A	HCAPLUS
Weissmantel, C	1980	72	19	Thin Solid Films	HCAPLUS

Widany, J	1996 6	899	J Mater Chem	HCAPLUS
Woollam Co	1995		Guide to Using WVASE	
Yao, H	1991 70	3261	J Appl Phys	HCAPLUS
Zhou, W	1995 66	2490	Appl Phys Lett	HCAPLUS

L109 ANSWER 6 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 2000:1300 HCAPLUS

DN 132:80442

TI Structure investigation of **BN** films grown by ion-beam-assisted deposition by means of polarized **IR** and Raman spectroscopy

AU El Mekki, M. Ben; Djouadi, M. A.; Guiot, E.; Mortet, V.; Pascallon, J.; Stambouli, V.; Bouchier, D.; Mestres, N.; Nouet, G.

CS Laboratoire Bourguignon des Materiaux et Procédes, ENSAM, Cluny, F-71250, Fr.

SO Surface and Coatings Technology (1999), 116-119, 93-99

CODEN: SCTEEJ; ISSN: 0257-8972

PB Elsevier Science S.A.

DT Journal

LA English

AB We present an optical investigation, by means of polarized **IR** spectroscopy and Raman scattering, of the microstructure and crystallinity of mixed films of **hexagonal** and **cubic boron nitride** (**h-BN** and **c-BN**, resp.). The films were deposited on an unheated silicon substrate by the ion-beam-assisted deposition method (IBAD) at low energy (400-500 eV). The deposition temperature, due to the ion bombardment, was in the range 200-250° at the end of the deposition process. Different film types were grown on a silicon substrate of dimensions 75 mm + 15 mm by changing the ion (**nitrogen** + **argon**) to atom (thermal boron) arrival ratio, $\phi_{\text{ion}}/\phi_{\text{B}}$, in the range 0.69-3. Polarised **IR** reflectivity (PIRR) spectra were acquired at different positions on the **BN** film (different arrival ratios $\phi_{\text{ion}}/\phi_{\text{B}}$) and show an important upwards shift of transverse optical (TO) and longitudinal optical (LO) phonons of the twofold degenerated mode **Elu** of the **sp2** phase at the transition zone from **sp2** to **sp3** phases. Several processes can shift the **IR** phonon peaks, including the degree of crystallinity, film thickness, film stoichiometry and intrinsic stress. The micro-Raman results and the full-width at half-maximum values of TO phonons of the **Elu** mode show that the **BN** film has a similar crystallinity in all regions. The effect of the film thickness was shown by using a microstructure-dependent model for the **IR** anisotropic effective dielec. function of thin films. In order to show the influence of the film stoichiometry in the **Elu**(TO) peak positions, a series of samples was deposited at 100% of **nitrogen** by changing the arrival flux $\phi_{\text{N}}/\phi_{\text{B}}$ in the interval 0.75-2.5. It have been observed that, in this range of flux ratio, the **Elu**(TO) phonon shift is negligible in comparison with the shift observed in the PIRR measurements. This results suggest that this **Elu**(TO) phonon shift is due to the intrinsic stress. If we consider the findings of Friedmann et al. (1994) who suggested that nucleation of the **cubic** phase occurs as a result of extremely high stress, and those of Medlin et al. (1996) who showed a direct route to **c-BN** formation via a transformation of **h-BN** into rhombohedral **BN** (**r-BN**), we can conclude that, in our case, the shift observed is due to an intrinsic high-stress phase. Then, a structural modification of **h-BN** into **r-BN** phase might be involved as a precursor for nucleation of the **cubic** phase.

CC 49-5 (Industrial Inorganic Chemicals)

Section cross-reference(s): 57, 73, 76

ST **boron nitride** ion beam assisted deposition

IT Optical transmission
(IR; structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

IT Vapor deposition process
(ion-beam-assisted; structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

IT Crystallinity
IR reflection
Microstructure
Stress, mechanical
Structural phase transition
(structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

IT 10043-11-5P, Boron nitride, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

IT 7440-21-3, Silicon, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

IT 10043-11-5P, Boron nitride, preparation
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(structure investigation of BN films grown by ion-beam-assisted deposition by polarized IR and Raman spectroscopy)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Anon	1994			Properties of Groups	
Ben El Mekki, M	1999			Diamond Relat Mater	
Bouchier, D	1994	89	369	Nucl Instrum Methods	HCAPLUS
Boudiombou, J	1997	46	96	Mater Sci Eng B	
Burat, O	1990	68	2780	J Appl Phys	HCAPLUS
Djouadi, M	1998	17	1657	Diamond Relat Mater	HCAPLUS
Geick, R	1966	146	543	Phys Rev	HCAPLUS
Gielisse, P	1967	155	1039	Phys Rev	HCAPLUS
Hofsass, H	1997	55	13230	Phys Rev B	HCAPLUS
Ilias, S	1998			J Appl Phys submitte	
Medlin, D	1996	79	3567	J Appl Phys	HCAPLUS
Mirkarimi, P	1998			Mater Sci Eng Rep in	
Nemanich, R	1981	23	6348	Phys Rev B	HCAPLUS
Plass, M	1996	69	46	J Appl Phys Lett	HCAPLUS
Polo, M	1997	6	1550	Diamond Relat Mater	HCAPLUS
Schubert, M	1997	56	13306	Phys Rev B	HCAPLUS
Stambouli, V	1990	43/44	137	Surf Coat Technol	
Werninghaus, T	1997	70	958	Appl Phys Lett	HCAPLUS

L109 ANSWER 7 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
AN 1999:229229 HCAPLUS

DN 130:359534
 TI New Phase of **sp3**-Bonded BN: The **5H**
Polytype
 AU **Komatsu, Shojiro; Okada, Katsuyuki; Shimizu, Yoshiki;**
Moriyoshi, Yusuke
 CS National Institute for Research in Inorganic Materials, Tsukuba Ibaraki,
 305-0044, Japan
 SO Journal of Physical Chemistry B (1999), 103(17), 3289-3291
 CODEN: JPCBFK; ISSN: 1089-5647
 PB American Chemical Society
 DT Journal
 LA English
 AB A new phase of **sp3**-bonded BN, i.e., **5H**
polytype, was found. The representative lattice parameters *a* and
c are 2.528 and 10.407 Å, resp. The new BN phase was prepared by CVD
 assisted with 193 nm laser **irradiation** of the surface. Source
gases were diborane and **NH3** diluted in **Ar** and **H**.
 The substrate temperature was 850°.
 CC 75-7 (Crystallography and Liquid Crystals)
 ST laser assisted CVD **boron nitride 5H**
polytype; structure **boron nitride 5H**
polytype crystal
 IT Vapor deposition process
 (chemical, laser-assisted; laser-assisted CVD and crystal structure of
sp3-bonded **boron nitride 5H**
polytype)
 IT Crystal structure
Polytypism
 (laser-assisted CVD and crystal structure of **sp3**-bonded
boron nitride 5H polytype)
 IT 10043-11-5, **Boron nitride** (BN), properties
 RL: PEP (Physical, engineering or chemical process); PRP (Properties);
 PROC (Process)
 (laser-assisted CVD and crystal structure of **sp3**-bonded
boron nitride 5H polytype)
 IT 10043-11-5, **Boron nitride** (BN), properties
 RL: PEP (Physical, engineering or chemical process); PRP (Properties);
 PROC (Process)
 (laser-assisted CVD and crystal structure of **sp3**-bonded
boron nitride 5H polytype)
 RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

RETABLE

Referenced Author (RAU)	Year (RPY)	VOL (RVL)	PG (RPG)	Referenced Work (RWK)	Referenced File
Bundy, F	1963	38	1144	J Chem Phys	HCAPLUS
Komatsu, S	1997	12	1675	J Mater Res	HCAPLUS
Konyashin, I	1997	3	239	Chem Vapor Depositi	HCAPLUS
Moriyoshi, Y	1995	111/1	267	Key Eng Mater	
Narula, K	1995			Ceramic Precursor Te	
Soma, T	1974	9	755	Mater Res Bull	HCAPLUS
Verma, A	1966			Polymorphism and Pol	
Wentrof, R	1957	26	956	J Chem Phys	
Wentrof, R	1961	34	809	J Chem Phys	

Yarbrough, S |1997 |81 |7798 |J Appl Phys |

L109 ANSWER 8 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1997:109630 HCAPLUS

DN 126:204896

TI Selective chemical etching of **hexagonal boron nitride** compared to **cubic boron nitride**

AU Harris, Stephen J.; Weiner, Anita M.; Doll, Gary L.; Meng, Wen-Jin
CS Physics and Physical Chemistry Department, General Motors RandD Center, Warren, MI, 48090-9055, USA

SO Journal of Materials Research (1997), 12(2), 412-415
CODEN: JMREEE; ISSN: 0884-2914

PB Materials Research Society

DT Journal

LA English

AB A BN film containing comparable amts. of **sp2** and **sp3** phases was subjected to a **gas**-phase chemical etch in a hot-filament environment containing 1% CH₄ in H₂. After a partial etch, examination by FTIR shows that the **sp2** was preferentially etched, leaving a larger **sp3** fraction than in the unetched film. The possibility that preferential etching could be used to increase the purity of **cubic BN** films is discussed.

CC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

Section cross-reference(s): 57, 76

ST **boron nitride** chem etching

IT IR spectra
(Fourier-transform; of selectively chemical etched **boron nitride**)

IT IR absorption
(by selectively chemical etched **boron nitride**)

IT Etching
(selective chemical etching of **hexagonal boron nitride** compared to **cubic boron nitride**)

IT 10043-11-5, **Boron nitride**, properties
RL: PRP (Properties); RCT (Reactant); RACT (Reactant or reagent)
(**cubic**; selective chemical etching of **hexagonal boron nitride** compared to **cubic boron nitride**)

IT 10043-11-5, **Boron nitride**, properties
RL: PRP (Properties); RCT (Reactant); RACT (Reactant or reagent)
(**cubic**; selective chemical etching of **hexagonal boron nitride** compared to **cubic boron nitride**)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 9 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1997:92788 HCAPLUS

DN 126:245439

TI Sputter deposition of **boron nitride** using **neon**-**nitrogen** discharges

AU Heil, R. B.; Aita, C. R.

CS Department of Materials and Laboratory for Surface Studies, University of Wisconsin-Milwaukee, Milwaukee, WI, 53201, USA

SO Journal of Vacuum Science & Technology, A: Vacuum, Surfaces, and Films (1997), 15(1), 93-98
CODEN: JVTAD6; ISSN: 0734-2101

PB American Institute of Physics

DT Journal

LA English

AB **Boron nitride** films were grown by sputtering a **hexagonal boron nitride (BN)** pressed powder target in **Ne/N₂** discharges at two levels of substrate bias. Optical emission spectrometry was used to monitor the **N₂⁺** ion population in the discharge. Post-deposition, information about B-N bonding in the films was obtained using near **UV**-visible spectrophotometry to determine optical absorption edge characteristics, and **IR** transmission spectrometry to determine vibrational frequencies of B-N groups. The results are compared to films grown in **Ar/N₂** discharges at the same excitation conditions. The goal was to examine the effect of an enhanced **N₂⁺** ion population (characteristic of **Ne/N₂** discharges) on B-N bonding. **N₂⁺** enhancement alone, without substrate bias, cannot produce **sp³** bonding. Biasing results in **sp³**-bonded BN with wurtzite short-range order. Without exception, films on grounded substrates have **sp²** bonding. A simple model is proposed to relate optical edge disorder in **sp²**-bonded BN (associated with B-N bond length randomness) to **N₂⁺** adsorption at the growth interface.

CC 76-11 (Electric Phenomena)
Section cross-reference(s): 75

ST **boron nitride** sputter deposition **gas** discharge

IT Bond length
Interfacial structure
Optical absorption
(optical absorption of **boron nitride** from **N-Ne** discharge sputter deposition)

IT Electric discharge
Sputtering
(sputter deposition of **boron nitride** using **neon-nitrogen** discharges)

IT 10043-11-5P, **Boron nitride (BN)**, properties
RL: PNU (Preparation, unclassified); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(sputter deposition of **boron nitride** using **neon-nitrogen** discharges)

IT 7440-01-9, **Neon**, reactions 17778-88-0, Atomic **nitrogen**, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(sputter deposition of **boron nitride** using **neon-nitrogen** discharges)

IT 10043-11-5P, **Boron nitride (BN)**, properties
RL: PNU (Preparation, unclassified); PRP (Properties); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(sputter deposition of **boron nitride** using **neon-nitrogen** discharges)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 10 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 1995:783863 HCAPLUS
 DN 123:297889
 TI Surface characterization of **hexagonal** and **cubic**
boron nitride films synthesized using IBAD
 AU Sene, G.; Bouchier, D.; Ilias, S.; Djouadi, M. A.; Stambouli, V.; Moeller,
 P.; Hug, G.; Reinke, S.
 CS Lab. Microstructures, ONERA, Chatillon, F-92322, Fr.
 SO Proceedings - Electrochemical Society (1995), 95-4(Proceedings
 of the International Symposium on Diamond Materials, 1995), 377-82
 CODEN: PESODO; ISSN: 0161-6374
 PB Electrochemical Society
 DT Journal
 LA English
 AB **C-BN** and **h-BN** films were
 synthesized using ion beam assisted deposition (IBAD). TtEELS and REELS
 analyses performed at various primary energies enabled us to emphasize
 analyses performed at various primary energies enabled us to emphasize the
 differences between **sp3** and **sp2** bonded films. Consequences on
 the **c-BN** growth modeling are discussed based on the
 following result that polycryst. **cubic BN** films
 exhibit a superficial zone with a **sp2** hybridization. The thickness of
 this superficial zone is increased by a post-deposition ion beam
 bombardment at an energy value higher than that used for deposition. The
 "subplantation" models fit well with this behavior. However, a possible
 surface reconstruction cannot be excluded to explain our REELS results.
 CC 66-3 (Surface Chemistry and Colloids)
 ST **boron nitride** surface structure electron configuration
 IT Electron configuration and Electron density
 Surface structure
 (surface characterization of **hexagonal** and **cubic**
boron nitride films synthesized using ion beam
 assisted deposition)
 IT 10043-11-5, **Boron nitride**, properties
 RL: PRP (Properties)
 (surface characterization of **hexagonal** and **cubic**
boron nitride films synthesized using ion beam
 assisted deposition)
 IT 10043-11-5, **Boron nitride**, properties
 RL: PRP (Properties)
 (surface characterization of **hexagonal** and **cubic**
boron nitride films synthesized using ion beam
 assisted deposition)
 RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 11 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 1994:468369 HCAPLUS
 DN 121:68369
 TI **Infrared** spectroscopic investigations on **h-BN**
 and mixed **h/c-BN** thin films
 AU Jaeger, S.; Bewilogua, K.; Klages, C. P.
 CS Fraunhofer-Institut fuer Schicht- und Oberflaechentechnik (FhG-IST),

Vogt-Koelln-Str. 30, Hamburg, D-22527, Germany
 SO Thin Solid Films (1994), 245(1-2), 50-4
 CODEN: THSFAP; ISSN: 0040-6090
 DT Journal
 LA English
 AB The integrated absorptions of the **IR** active bands at
 .apprx.1390, 1080, and 780 cm⁻¹ were used to determine the content of
hexagonal B nitride h-BN
 (sp² bonding state) and **cubic B nitride**
c-BN (sp³ bonding state) modifications in r.f.
 sputtered stoichiometric **BN** films. For the calcn. of oscillator
 number densities in **hexagonal B nitride** (**h-BN**) from integrated absorptions, calibration consts.
 Ah can be used, which are 1.7 + 1019cm⁻² for the B-N stretching
 vibration at 1390 cm⁻¹ and 9.1 + 1019 cm⁻² for the B-N-B bending
 vibration at 780 cm⁻¹, resp. The ratio of the volume fractions fc/fh of
 mixed **h/c-BN** films can be determined from the
 ratios of the absorption coeffs. $\alpha(1080 \text{ cm}^{-1})/\alpha(1390 \text{ cm}^{-1})$ and
 $\alpha(1080 \text{ cm}^{-1})/\alpha(780 \text{ cm}^{-1})$ multiplied by factors of 0.6 and
 0.19, resp.
 CC 73-3 (Optical, Electron, and Mass Spectroscopy and Other Related
 Properties)
 ST **IR spectra boron nitride hexagonal**
cubic
 IT **Infrared spectra**
 (of **boron nitride hexagonal** and mixed
hexagonal/cubic thin films)
 IT Absorptivity
 (of **boron nitride hexagonal** and mixed
hexagonal/cubic thin films in **IR** region)
 IT 10043-11-5, **Boron nitride**, properties
 RL: PRP (Properties)
 (IR spectra of **hexagonal** and mixed
hexagonal/cubic thin films of)
 IT 10043-11-5, **Boron nitride**, properties
 RL: PRP (Properties)
 (IR spectra of **hexagonal** and mixed
hexagonal/cubic thin films of)
 RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 12 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 1991:497752 HCAPLUS
 DN 115:97752
 TI Microstructure of pressureless sintered **h-boron**
nitride
 AU Miyazaki, Yuji; Harada, Hiroshi; Sakamaki, Shozo; Hagio, Tsuyoshi
 CS Denki Kagaku Kogyo Co., Ltd., Omuta, 836, Japan
 SO Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi (1991), 99(July), 582-5
 CODEN: NSKRE2; ISSN: 0914-5400
 DT Journal
 LA Japanese
 AB The microstructure of pressureless-sintered bodies of **hexagonal**
(h)-BN prepared from a powder activated by mechanochem.
 treatments was examined by SEM and TEM. The BN compacts showed a

3-dimensionally bonded network structure consisting of platey BN microcrystals. The interconnected regions between 2 particles are continuous in microstructure without any orientational relation between them. The interconnected network, which would improve properties of BN bodies, was characterized for the pressureless sintered bodies.

CC 57-2 (Ceramics)
 ST microstructure **boron nitride** pressureless sintering
 IT Ceramic materials and wares
 (**boron nitride**, microstructure of
 pressureless-sintered **hexagonal**)
 IT Sintering
 (pressureless, of **boron nitride**, microstructure in
 relation to)
 IT 10043-11-5, **Boron nitride**, uses and
 miscellaneous
 RL: USES (Uses)
 (ceramics, microstructure of pressureless-sintered **hexagonal**)
 IT 10043-11-5, **Boron nitride**, uses and
 miscellaneous
 RL: USES (Uses)
 (ceramics, microstructure of pressureless-sintered **hexagonal**)
 RN 10043-11-5 HCAPLUS
 CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 13 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
 AN 1990:576766 HCAPLUS
 DN 113:176766
 TI Low-energy Auger transitions of **hexagonal** and **cubic**
 boron nitride (**h-BN** and **c-**
 BN): an example of the influence of crystallographic structure on
 the Auger decay
 AU Hanke, G.; Kramer, M.; Mueller, K.
 CS Dep. Dev. Constr., FAG Kugelfischer K.G.a.A., Schweinfurt, D-8720, Germany
 SO Materials Science Forum (1990), 54-55(Synth. Prop. Boron
 Nitride), 207-27
 CODEN: MSFOEP; ISSN: 0255-5476
 DT Journal
 LA English
 AB Auger spectra obtained from **cubic** and **hexagonal**
 BN are presented and compared with those observed for B, B₄C, and
 B₂O₃. Characteristic changes in these low-energy spectra depend on the
 addnl. decay channels supplied by the bonding partners for the
 recombination of the B core hole. Supported by SXS data, the main
 features can be understood in terms of a selfconvolution model of the
 p-like degree of sensitization (DOS). Deviations from this model can be
 discussed by partial localization in the bonding resulting in different
 final states. Especially the existance of an extra peak at the low-energy side
 of the B-KVV transitions of the nitrides and the oxide can be explained by
 this model. Based on EELS-measurements a high-energy peak in the Auger
 multiplet of **h-BN** may be the direct
 nonradiative recombination of a core exciton. The comparison of
 the new Auger data for **c-BN** with those observed from
 h-BN reveals differences which are not expected by
 regarding their quite similar local DOS from SXS spectra. The differences
 are attributed to the different **sp3** and **sp2** hybridization

leading to distinct localizations.

CC 57-2 (Ceramics)

ST Auger spectra **boron nitride**

IT Electron emission
(Auger, of **boron nitride**, crystallog. structure effect on)

IT 10043-11-5, **Boron nitride (BN)**,
properties
RL: PRP (Properties)
(Auger spectra of **cubic** and **hexagonal**)

IT 10043-11-5, **Boron nitride (BN)**,
properties
RL: PRP (Properties)
(Auger spectra of **cubic** and **hexagonal**)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

L109 ANSWER 14 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

AN 1980:200320 HCAPLUS

DN 92:200320

TI Formation and shape of fibrous **h boron nitride**

AU Sato, Tadao; Sekikawa, Yoshizo; Ishii, Toshihiko

CS Natl. Inst. Res. Inorg. Mater., Tokyo, Japan

SO Koen Yoshishu - Jinko Kobutsu Toronkai, 24th (1979), 45-6 Publisher: Jinko Kobutsu Toronkai Jimu Senta, Nagoya, Japan.
CODEN: 42NKAR

DT Conference

LA Japanese

AB Powdered **hexagonal BN** was heated in a graphite crucible at 2100° under **N2** for 2 h to form white fibers containing mainly B and N. There were 4 shapes of fibrous **hexagonal BN**: jellyfish shape, bone shape, field-horsetail shape, and bulb shape.

CC 49-5 (Industrial Inorganic Chemicals)

ST **boron nitride hexagonal** fiber

IT Synthetic fibers
RL: USES (Uses)
(**boron nitride**, shape of)

IT 10043-11-5P, uses and miscellaneous
RL: PREP (Preparation)
(preparation and shape of fibers of)

IT 10043-11-5P, uses and miscellaneous
RL: PREP (Preparation)
(preparation and shape of fibers of)

RN 10043-11-5 HCAPLUS

CN Boron nitride (BN) (CA INDEX NAME)

B≡N

=> => fil wpix
FILE 'WPIX' ENTERED AT 16:35:45 ON 25 JUL 2007

jan delaval - 24 july 2007

COPYRIGHT (C) 2007 THE THOMSON CORPORATION

FILE LAST UPDATED: 24 JUL 2007 <20070724/UP>
MOST RECENT THOMSON SCIENTIFIC UPDATE: 200747 <200747/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

>>> IPC Reform backfile reclassification has been loaded to 31 May 2007. No update date (UP) has been created for the reclassified documents, but they can be identified by 20060101/UPIC and 20061231/UPIC and 20060601/UPIC. <<<

FOR A COPY OF THE DERWENT WORLD PATENTS INDEX STN USER GUIDE,
PLEASE VISIT:
http://www.stn-international.de/training_center/patents/stn_guide.pdf

FOR DETAILS OF THE PATENTS COVERED IN CURRENT UPDATES, SEE
<http://scientific.thomson.com/support/patents/coverage/latestupdates/>

>>> FOR DETAILS ON THE NEW AND ENHANCED DERWENT WORLD PATENTS INDEX
PLEASE SEE
http://www.stn-international.de/stndatabases/details/dwpi_r.html <<<
'BI ABEX' IS DEFAULT SEARCH FIELD FOR 'WPIX' FILE

=> d bib ab tech abex tot

L124 ANSWER 1 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
AN 2002-158148 [21] WPIX
DNC C2002-049429 [21]
TI Manufacture of **boron nitride** nano tube with
SP3 bonding, involves irradiating carbon dioxide laser on
substance containing carbon and boron and forming **boron**
nitride on surface of substance using supercritical nitrogen
DC L02; L03
IN KURASHIMA K; YUSA H
PA (DOKU-N) DOKURITSU GYOSEI HOJIN BUSSHITSU ZAIRYO
CYC 1
PIA JP 2001270707 A 20011002 (200221)* JA 4[4] <--
JP 3448638 B2 20030922 (200363) JA 4
ADT JP 2001270707 A JP 2000-87835 20000328; JP 3448638 B2 JP
2000-87835 20000328
FDT JP 3448638 B2 Previous Publ JP 2001270707 A
PRAI JP 2000-87835 20000328
AB JP 2001270707 A UPAB: 20050525
NOVELTY - A substance containing carbon and boron is irradiated by a
carbon dioxide laser at a high pressure of 5 GPa or more using a diamond
Anvil cell apparatus at 1000degreesC or more. A **boron**
nitride component is formed on the surface of the raw material
substance using a supercritical nitrogen fluid, and **boron**
nitride nano tube with SP3 bonding is obtained.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for
boron nitride nano tube containing SP3 bonding
close to the center of shell.
USE - For manufacture of **boron nitride** nano
tube with SP3 bonding used for electronic device.
ADVANTAGE - **Boron nitride** nano tube with
SP3 bonding and high rigidity is obtained.
DESCRIPTION OF DRAWINGS - The figure shows schematic diagram of
boron nitride nano tube manufacturing apparatus.
(Drawing includes non-English language text).

L124 ANSWER 2 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
AN 1999-228510 [19] WPIX
DNC C1999-067163 [19]
DNN N1999-169071 [19]
TI Ion-implantation converts **hexagonal boron nitride** to cubic form - by implanting nitrogen ions into a thin film on a substrate at low temperatures
DC L03; V05; X14
IN DOLL G L; MANTESE J V
PA (GENK-C) GENERAL MOTORS CORP
CYC 1
PIA US 5885666 A 19990323 (199919)* EN 6[3] <--
ADT US 5885666 A US 1997-851801 19970506
PRAI US 1997-851801 19970506
AB US 5885666 A UPAB: 20050521
NOVELTY - Nitrogen ions are implanted into about one-half the depth of a film no more than 100 nm thick containing sp²-bonded boron and nitrogen atoms to convert many of these to **sp³** bonding. DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method comprising implanting nitrogen ions at 180 keV, 2E17 cm⁻² and 50 -100 µA.
USE - For converting poorly crystallised **hexagonal**-like BN films with sp² bonding into amorphous cubic-like material with **sp³** bonding for protective, wear-resistant coatings, abrasives and machining inserts.
ADVANTAGE - The use of very high temperatures and pressures in the conversion is avoided and temperatures of 150 °C or less can be used. DESCRIPTION OF DRAWING(S) - Near-edge x-ray absorption fine structure spectra are shown for the BN species.

L124 ANSWER 3 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
AN 1998-125961 [12] WPIX
DNC C1998-041438 [12]
DNN N1998-100434 [12]
TI Preparation of **sp³ bonded boron nitride** - by introducing sources of boron and nitrogen into reaction vessel and growing **sp³ bonded boron nitride**
DC E36; L02; L03; P54; U11
IN MATSUMOTO S
PA (KAGG-C) KAGAKU GIJUTSUCHO MUKIZAISHITSU
CYC 1
PIA JP 10007409 A 19980113 (199812)* JA 4[1] <--
JP 2920203 B2 19990719 (199934) JA 4 <--
ADT JP 10007409 A JP 1996-184097 19960625; JP 2920203 B2 JP 1996-184097 19960625
FDT JP 2920203 B2 Previous Publ JP 10007409 A
PRAI JP 1996-184097 19960625
AB JP 10007409 A UPAB: 20050520
Preparation of **sp³ bond boron nitride** in which sources of boron and nitrogen in a gaseous state are introduced into a reaction vessel and **sp³ bond boron nitride** is grown so that at least one of the substrate surface, growth surface of the substrate, and growth space is irradiated with ir and **boron nitride** is grown. Also claimed is preparation of semiconductor type **sp³ bond boron nitride**, in which at least one source of groups II, IV, and VI elements is introduced as an additive.
USE - The **sp³ bond boron nitride** can be used as cutting materials, abrasives, optoelectronic materials of wide band gap semiconductors, ultraviolet emitting materials, electroluminescent materials, and high-temperature semiconductor materials.

ADVANTAGE - The **sp3** bond **boron nitride** can be synthesised easily in a gaseous state.

L124 ANSWER 4 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1998-114667 [11] WPIX
 DNC C1998-037844 [11]
 TI Preparing four coordinate **boron nitride** material by photo-excitation - using sintered products and monocrystals of **boron nitride**, bonded in specific manner
 DC E33; L02; L03; U11; U12
 IN ERA A
 PA (HELI-N) HELIOS KOKAGAKU KENKYUSHO YG
 CYC 1
 PIA JP 10001304 A 19980106 (199811)* JA 4[2] <--
 ADT JP 10001304 A JP 1996-191318 19960617
 PRAI JP 1996-191318 19960617
 AB JP 10001304 A UPAB: 20060114
 In the preparation of four coordinate **boron nitride** material by photoexcitation, one of powders, sintered prods. and monocrystals of BN which is bonded with the **sp2** hybrid orbital, e.g. **hexagonal** BN (hBN), rhomboid BN (rBN), pyrolytic BN (pBN), turbulent BN (tBN), and amorphous BN (aBN), all referred to as the **sp2** phase hereafter, is used as a raw material and irradiated heavily with ultrashort pulse laser beams which resonate with oscillation mode vertically displacing w.r.t. the face containing the bond consisting of the **sp2** hybrid orbital to produce four coordinate BN (referred to as the **sp3** phase hereafter) which is bonded with the **sp3** hybrid orbital, e.g. cubic BN (cBN) and wurtzite BN (wBN).
 USE - The BN can be used in light emitting diode and electroluminescent materials, semiconductor device materials for detecting neutrons, semiconductor device materials, and ultrahard materials for cutting and grinding.
 ADVANTAGE - Four coordinate **boron nitride** such as cBN and wBN can be produced without high-pressure and high-temperature conditions.

L124 ANSWER 5 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1995-130257 [17] WPIX
 DNC C1995-060229 [17]
 DNN N1995-102351 [17]
 TI Solid state conversion of **hexagonal** to cubic-like **boron nitride** - by annealing **hexagonal** material in a gaseous atmos.
 DC E36; L03; U11
 IN DOLL G L; HEREMANS J P
 PA (GENK-C) GENERAL MOTORS CORP
 CYC 1
 PIA US 5398639 A 19950321 (199517)* EN 5[1] <--
 ADT US 5398639 A US 1993-150312 19931112
 PRAI US 1993-150312 19931112
 AB US 5398639 A UPAB: 20050511
 A method of solid state conversion of **hexagonal** to cubic-like BN comprises providing a non-crystalline film comprising **hexagonal** BN film on a substrate, annealing the film in a gaseous atmos. $\leq 1000^{\circ}\text{C}$, $\leq 2\text{GPa}$ pressure, and without a catalyst so that a portion of the **hexagonal** BN in the film is converted to cubic-like BN.
 USE - Solid state conversion of **hexagonal** BN to cubic-like BN, for use in high power electronic and optoelectronic devices.
 ADVANTAGE - Conversion at relatively low pressure, crystalline cubic

BN formed, 90 weight% **sp3** bonded material.

L124 ANSWER 6 OF 6 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 1995-085177 [12] WPIX
 DNC C1995-038597 [12]
 TI Glass material holding and transporting member - have a thin film of **h-boron nitride** and amorphous **boron nitride** attached to a surface whilst in contact with the glass
 DC L01
 IN KAWAHO T
 PA (OLYU-C) OLYMPUS OPTICAL CO LTD
 CYC 1
 PIA JP 07010560 A 19950113 (199512)* JA 7
 JP 3049135 B2 20000605 (200032) JA 5
 ADT JP 07010560 A JP 1991-321197 19911108; JP 3049135 B2 JP 1991-321197 19911108
 FDT JP 3049135 B2 Previous Publ JP 07010560 A
 PRAI JP 1991-321197 19911108
 AB JP 07010560 A UPAB: 20050511
 A thin film of h-BN, amorphous BN or the mixture of these is attached to a surface to be kept in contact with glass, or a base or hard metal graphite, cyalone, AlN, quartz, SiC, Si3N4 or BN.
 ADVANTAGE - Deformation of transporting member can be prevented.

=> => d bib ab tech abex

L126 ANSWER 1 OF 1 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
 AN 2004-108798 [11] WPIX
 DNC C2004-044533 [11]
 DNN N2004-086442 [11]
 TI UV-emitting **sp3**-bonded **boron nitride** has a **hexagonal 5H-type** or **6H-type** polygonal structure, used as electronic material of e.g. light-emitting diode, as electron-emitting material and as material for coating surface of cutting tool
 DC E36; L03; V08
 IN KOMATSU S; MORIYOSHI Y; OKADA K
 PA (DOKU-N) DOKURITSU GYOSEI HOJIN BUSSHITSU ZAIRYO; (NAMA-N) NAT INST MATERIALS SCI
 CYC 29
 PIA WO 2004005186 A1 20040115 (200411)* JA 30[6]
 JP 2004035301 A 20040205 (200411) JA 15
 JP 3598381 B2 20041208 (200481) JA 13
 EP 1518824 A1 20050330 (200522) EN
 US 20060163527 A1 20060727 (200650) EN
 ADT WO 2004005186 A1 WO 2003-JP8370 20030701; JP 2004035301 A JP 2002-192863 20020702; JP 3598381 B2 JP 2002-192863 20020702 ; EP 1518824 A1 EP 2003-738617 20030701; EP 1518824 A1 WO 2003-JP8370 20030701; US 20060163527 A1 WO 2003-JP8370 20030701; US 20060163527 A1 US 2004-518644 20041220
 FDT JP 3598381 B2 Previous Publ JP 2004035301 A; EP 1518824 A1 Based on WO 2004005186 A
 PRAI JP 2002-192863 20020702
 AB WO 2004005186 A1 UPAB: 20060121
 NOVELTY - An **sp3**-bonded **boron nitride** is represented by BN, has a **hexagonal 5H-type** or **6H-type** polygonal structure and has the ability to emit light in the UV region.
 DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for (1)

the manufacture of the **sp³-bonded boron nitride** by introducing a reaction mixed gas containing boron and nitron diluted with a diluent gas into a reaction container, irradiating UV light on the substrate surface arranged in the container, the growth surface on the substrate, or near growth area, and forming **sp³-bonded** on the substrate by a vapor phase reaction; and (2) a functional material formed which contains the **sp³-bonded boron nitride**.

USE - The **boron nitride** is used e.g. as an electronic material of e.g. a light-emitting diode, as an electron-emitting material and as a material for coating the surface of a cutting tool.

ADVANTAGE - The **boron nitride** emits light of a sharp peak near 225 nm and is a material which can put a solid UV laser to a practical use.

DESCRIPTION OF DRAWINGS - Figure 1 shows the reaction container and its synthesis state. (Drawing contains non-English language text).

TECH

INORGANIC CHEMISTRY - Preferred Method: The diluent gas is a rare gas, hydrogen or nitrogen or their mixture. The amount of the reaction gas to the diluent gas is 100:0.0001-100 vol%. The UV light has a wavelength of 190-400nm. The UV light laser is a pulse laser.

ABEX

EXAMPLE - A diborane flow (5 sccm) and an ammonia flow (10 sccm) are introduced into a diluent gas flow mixture of argon flow amount 3 SLM and hydrogen flow amount 100 sccm. On a silicon substrate retained at 850degreesC by heating under an atmosphere of 20Torr, excimer laser UV light is irradiated. A material is obtained after 90 minutes. The crystal system by X-ray diffraction is **hexagonal** and **5H** polygonal structure with **sp³** bonding. The lattice constants are $a = 2.53\text{\AA}$, and $c = 10.40\text{\AA}$.

=> d his

(FILE 'HOME' ENTERED AT 15:27:54 ON 25 JUL 2007)

SET COST OFF

FILE 'HCAPLUS' ENTERED AT 15:28:09 ON 25 JUL 2007

L1	1	S	US20060163527/PN OR (US2004-518644# OR WO2003-JP8370 OR JP200
		E	KOMATSU/AU
L2	1	S	E3
		E	KOMATSU S/AU
L3	126	S	E3,E4
		E	KOMATSU SHO/AU
L4	70	S	E8
		E	KOMATSU NAME/AU
L5	30	S	E4
		E	OKADA/AU
L6	4	S	E3
		E	OKADA K/AU
L7	841	S	E3
L8	62	S	E46
		E	OKADA NAME/AU
L9	99	S	E4
		E	MORIYOSHI/AU
		E	MORIYOSHI Y/AU
L10	273	S	E3,E10-E12
L11	1	S	E14
		E	MORIYOSHI NAME/AU
		E	SHO/AU

L12 12 S E95
 E SHOJIRO/AU
 E KATSUYUKI/AU
 E YUSUKE/AU
 E NATIONAL INSTITUTE/PA,CS
 E NATIONAL INSTITUTE FOR/PA,CS
 E NATIONAL INSTITUTE FOR M/PA,CS
 L13 45 S E19-E48
 L14 316 S E99-E108
 L15 282 S E109-E142
 E NAT INST/PA,CS
 E NAT INST MAT/PA,CS
 E N INST MAT/PA,CS
 E NAT INS MAT/PA,CS
 E NAT INST MAT/CO
 E NATION INST/CO
 L16 3 S E9
 E NATIONAL INST/CO
 E NATION INST MAT/CO
 L17 3 S E7
 L18 1 S L1 AND L2-L17
 SEL RN

FILE 'REGISTRY' ENTERED AT 15:34:56 ON 25 JUL 2007

L19 3 S E1-E3
 L20 1 S L19 AND BN/MF
 E BN/MF
 L21 11 S E3
 L22 11 S L20,L21
 L23 2 S L19 NOT L22

FILE 'HCAPLUS' ENTERED AT 15:44:51 ON 25 JUL 2007

L24 24313 S L22
 L25 24772 S BORON NITRIDE
 L26 537 S BORON MONONITRIDE
 L27 4 S BORONNITRIDE
 L28 26241 S L24-L27
 L29 190 S L28 AND SP3
 L30 1 S L28 AND SP 3
 L31 191 S L29,L30
 L32 137 S L31 AND PY<=2002 NOT P/DT
 L33 7 S L31 AND (PD<=20020702 OR PRD<=20020702 OR AD<=20020702) AND P
 L34 144 S L32,L33
 L35 2 S L34 AND (5H OR 6H) (L)HEXAGON?
 L36 50 S L34 AND HEXAGON?
 L37 3 S L34 AND POLYTYP?
 L38 3 S L34 AND LIGHT(L) (EMIT? OR EMIS?)
 L39 8 S L34 AND UV
 L40 8 S L34 AND (ULTRAVIOL? OR ULTRA VIOL?)
 L41 36 S L34 AND IR
 L42 9 S L34 AND IRRADIAT?
 L43 7 S L34 AND LIGHT
 E UV/CT
 L44 7784 S E20-E22 OR E20+OLDNT OR E56-E58 OR E56+OLD,NT OR E60+OLD,NT
 L45 1 S E78
 L46 7883 S E81+OLD,NT OR E83+OLD,NT OR E84 OR E87+OLD,NT OR E88-E90
 L47 394 S E136+OLD,NT OR E136-E138
 L48 4414 S E152+OLD,NT OR E153
 E E78+ALL
 L49 1 S L34 AND L44-L48

```

      E LASER/CT
      E LASERS/CT
L50   145812 S E3+OLD,NT
L51   2164 S E50,E51
L52   1 S L34 AND L50,L51
      E ELECTROLUMINESC/CT
L53   58513 S E4 OR E8+OLD,NT
      E E4+ALL
L54   8790 S E2
      E E2+ALL
L55   269728 S E7+OLD,NT OR E8 OR E9
      E E14+ALL
L56   58339 S E18+OLD
L57   3 S L34 AND L50-L56
L58   82 S L35-L43,L49,L52,L57
L59   3 S L1-L18 AND L34
L60   82 S L58,L59
L61   3 S L34 AND (5H OR 6H) (L) POLYTYP?
L62   82 S L60,L61
L63   7614 S L25/TI
L64   14 S L26/TI
L65   0 S L27/TI
L66   2574 S BN/TI
L67   70 S L62 AND L63-L66
L68   12 S L62 NOT L67
L69   14 S L67 AND (CBN OR BCN OR B C N OR C B N)
      SEL AN 7 9 11 L69
L70   3 S L69 AND E1-E6
L71   56 S L67 NOT L69
L72   34 S L71 AND CUBIC
L73   22 S L72 AND (IR OR ?RADIAT? OR INFRARED?)
L74   15 S L71 AND GAS?
L75   35 S L59,L70,L73,L74
L76   32 S L71,L72 AND L75
L77   35 S L75,L76
L78   24 S L71,L72 NOT L77
L79   59 S L77,L78
L80   37 S L79 AND (C OR CUBIC) (S) (BN OR BORON NITRIDE OR BORON MONONITR
L81   38 S L79 AND HEXAG?
L82   51 S L80,L81
L83   4 S L79 AND (5H OR 6H)
L84   4 S L34 AND (5H OR 6H)
L85   4 S L83,L84
L86   4 S L59,L85 AND L1-L18,L24-L85
L87   50 S L34 AND HEXAG?
L88   3 S L34 AND POLYTYP?
L89   4 S L86,L88
L90   48 S L87 NOT L89
      SEL DN AN 10 24 25 33 38 44 L90
L91   6 S L90 AND E7-E24
L92   10 S L89,L91
L93   944 S H BN
L94   6 S H() (L25 OR L26 OR L27)
      SEL DN 4-6
L95   3 S L94 AND E25-E27
L96   13 S L92,L95
L97   31 S L93 AND (SP3 OR SP 3)
L98   22 S L97 AND PY<=2002 NOT P/DT
      SEL DN AN 8 21
L99   2 S L98 AND E28-E33

```

L100 14 S L96,L99 AND L1-L18,L24-L99
L101 12 S L100 AND (H OR HEXAG? OR C OR CUBIC) (S) (BN OR BORON NITRIDE O
L102 2 S L100 NOT L101
L103 14 S L101,L102
L104 3 S L103 AND B NITRIDE
L105 14 S L103,L104
L106 5 S L105 AND GAS?
L107 2 S L105 AND PLASMA

FILE 'HCAPLUS' ENTERED AT 16:26:56 ON 25 JUL 2007

L108 8 S L105 AND (H2 OR HYDROGEN OR HE OR HELIUM OR NE OR NEON OR AR
L109 14 S L105-L108

FILE 'HCAPLUS' ENTERED AT 16:28:19 ON 25 JUL 2007

FILE 'WPIX' ENTERED AT 16:28:36 ON 25 JUL 2007

L110 12010 S L25 OR L26 OR L27
E BORON NITRIDE/CN
L111 1 S E3
L112 5394 S R01893/DCN OR 1893/DRN
L113 1098 S B() (NITRIDE OR MONONITRIDE OR MONO NITRIDE)
L114 1628 S E31-Q03/MC
L115 14292 S L110,L112-L114
L116 20 S L115 AND (SP3 OR SP 3)
L117 13 S L116 AND (PD<=20020702 OR PRD<=20020702 OR AD<=20020702)
L118 11 S L115 AND (5H OR 6H)
L119 1121 S L115 AND HEXAG?
L120 7 S L118 AND (PD<=20020702 OR PRD<=20020702 OR AD<=20020702)
L121 6 S H() (BORON NITRIDE OR BORON MONONITRIDE OR BORON MONO NITRIDE
L122 25 S L117,L120,L121
L123 25 S L122 AND L110-L122
SEL AN 12 17 19 20-22
L124 6 S L123 AND E1-E6

FILE 'WPIX' ENTERED AT 16:35:45 ON 25 JUL 2007

L125 19 S L123 NOT L124
SEL AN 4
L126 1 S L125 AND E7

=>